Electrochemical detection of pyocyanin as a biomarker for bacterial infections

Al Atraktchi, Fatima Al-Zahraa; Svendsen, Winnie Edith; Breum Andersen, Sandra; Molin, Søren; Johansen, Helle Krogh

Publication date:
2015

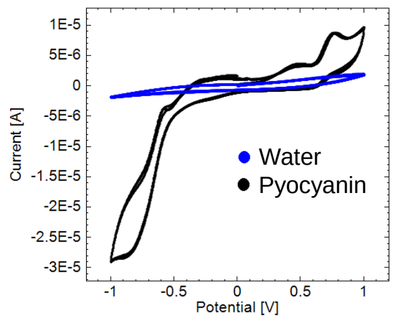
Document Version
Publisher's PDF, also known as Version of record

Motivation

The redox-active pyocyanin is produced by *P. aeruginosa* during infections and is released prior to virulent activity. Monitoring the level of pyocyanin as an infection biomarker could enable early detection of bacterial infections.

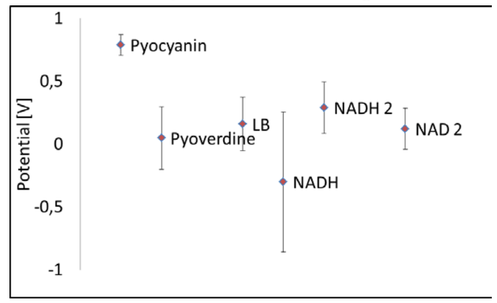
1

Cyclic voltammogram
– The fingreprint of pyocyanin



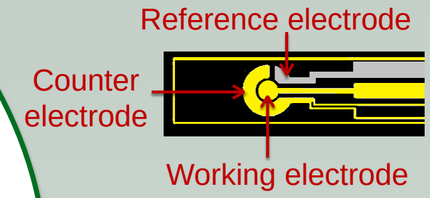
2

Selective detection of pyocyanin
- No overlap between signals



Concept

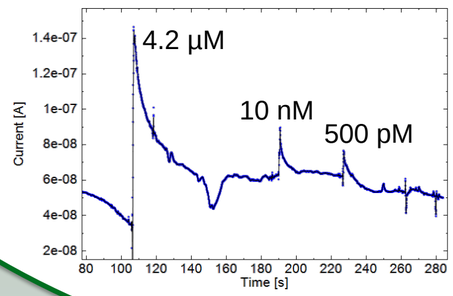
Electrochemical sensing of pyocyanin is conducted using micro-sensors. The sensor consists of three electrodes and requires only micro-liter volume of the sample.



Electrochemical detection of pyocyanin as a biomarker for bacterial infections

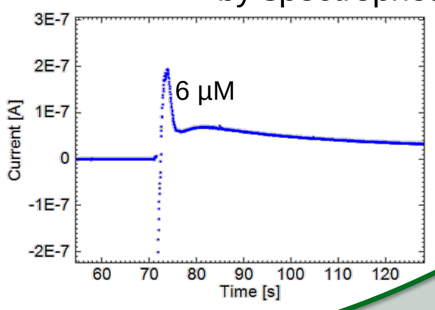
3

Chronoamperometry
– Quantification of pyocyanin below detection limit of HPLC (7.2 µM)



4

Detection of pyocyanin in isolate from cystic fibrosis patient
- No pyocyanin was detected in isolate by spectrophotometry!



Impact

Development of this novel detection technique will optimize early diagnosis of bacterial infections and lead to new guidelines in this area. The information revealed by pyocyanin sensing will be of great value when designing new antibiotic treatment strategies.

Summary

A precise and early diagnosis of an infection is essential for successful eradication treatment. Hence early diagnosis has direct impact on the morbidity and mortality of patients. This can be achieved by electrochemical micro-sensing of pyocyanin as an infection biomarker.

 Fatima AlZahra'a Alatraktchi[1,2,3], Winnie E. Svendsen[1], Sandra Breum Andersen[3], Søren Molin[2,3], Helle Krogh Johansen[3,4]

[1] Department of Micro- and Nanotechnology – Technical University of Denmark
[2] Department of Systems Biology
[3] Novo Nordisk Foundation Center for Biosustainability - Technical University of Denmark
[4] Cystisk fibrose klinikken & Klinisk mikrobiologisk afdeling - Rigshospitalet

Contact: faaat@nanotech.dtu.dk